

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 23 May 2001 (23.05.01)	
International application No. PCT/EP00/08653	Applicant's or agent's file reference TH 1549 PCT
International filing date (day/month/year) 01 September 2000 (01.09.00)	Priority date (day/month/year) 03 September 1999 (03.09.99)
Applicant CHEN, Ye-Mon et al	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

29 March 2001 (29.03.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Juan Cruz Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TH 1549 PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 08653	International filing date (day/month/year) 01/09/2000	(Earliest) Priority Date (day/month/year) 03/09/1999
Applicant SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

2a _____



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

T/EP 00/08653

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C10G11/18 B01J8/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C10G B01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 27647 A (SHELL INT RESEARCH ;SHELL CANADA LTD (CA)) 12 September 1996 (1996-09-12) the whole document	1-15
A	US 3 071 540 A (MCMAHON ET AL) 1 January 1963 (1963-01-01) the whole document	1-15
A	EP 0 593 171 A (TEXACO DEVELOPMENT CORP) 20 April 1994 (1994-04-20) the whole document	1-15

☐ Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

1 December 2000

Date of mailing of the international search report

08/12/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Michiels, P

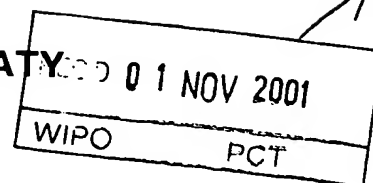
INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08653

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9627647	A	12-09-1996	US 5794857 A	18-08-1998
			US 5979799 A	09-11-1999
			AU 687675 B	26-02-1998
			AU 5104496 A	23-09-1996
			BR 9607665 A	16-06-1998
			CA 2214751 A	12-09-1996
			DE 69603356 D	26-08-1999
			DE 69603356 T	13-01-2000
			EP 0813582 A	29-12-1997
			ES 2136979 T	01-12-1999
			JP 11505168 T	18-05-1999
			ZA 9601832 A	17-09-1996
<hr/>				
US 3071540	A	01-01-1963	NONE	
<hr/>				
EP 0593171	A	20-04-1994	CA 2108215 A	14-04-1994
			DE 69304648 D	17-10-1996
			DE 69304648 T	13-02-1997
			FI 934519 A	14-04-1994
			JP 6264071 A	20-09-1994
			PL 300682 A	18-04-1994
			ZA 9307203 A	20-04-1994
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference TH 1549 PCT		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/08653	International filing date (day/month/year) 01/09/2000	Priority date (day/month/year) 03/09/1999	
International Patent Classification (IPC) or national classification and IPC C10G11/00			
Applicant SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 29/03/2001	Date of completion of this report 30.10.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Buesing, G Telephone No. +49 89 2399 8356 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/08653

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):
Description, pages:

1-3,6-19	as originally filed			
4,4a,5	as received on	08/10/2001	with letter of	08/10/2001

Claims, No.:

1-14	as received on	08/10/2001	with letter of	08/10/2001
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Drawings, sheets:

1/6-5/6	as originally filed			
6/6	as received on	08/10/2001	with letter of	08/10/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/08653

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Section V:

1. Reference is made to the following document which represents the closest prior art:

D1: WO 96/27647

2. The document D1 discloses a nozzle including the features defined in claim 1 (see D1, Figs. 1 to 5C and the corresponding description) with the exception of the circular slot forming the exit of the second cap and the third conduit surrounding the second conduit.

The subject-matter of claim 1 is therefore novel. This applies also for the remaining claims which are all related to claim 1.

3. The problem underlying the invention in view of D1 is to design a nozzle which is suitable for use as an improved bottom entry nozzle in a fluid catalytic cracking unit. This problem is solved by the distinguishing features.

Although D1 mentions that the nozzle is suitable as a bottoms nozzle in a catalytic cracking unit (see page 10, first paragraph), it appears that it is essentially designed as a side entry nozzle. There is no suggestion derivable from D1 to provide the known vessel with a third conduit for dispersing gas. The gas dispersing from this third conduit prevents that regenerated catalyst damages the feed nozzle and thus contributes to the solution of the problem.

4. In view of the non-obviousness of the claimed subject-matter, an inventive step is acknowledged for all of the claims.

Section VIII:

1. In claim 1, line 17, the first occurrence of "said" is superfluous and should be deleted.

Replaced
by A1, 34
Amendment
WO 01/18153

the exit, thus intended for enhancing the mixing with the regenerated catalyst. However, there are major drawbacks in these diverter designs. First, the hydrocarbon feed is atomized upstream of the diverter and when the atomized feed impinges on the surface of the diverter cone at the exit, re-coalescence of many of the atomized feed droplets occurs, leading to the formation of sheets of liquid discharging from the cone. The diverter cone achieves a change in the direction of the feed but this comes at the high price of significantly worsening feed atomization. Second, the radially discharging feed in the form of liquid sheets from the diverter cone can penetrate through catalyst in the riser without much vaporization and impinges on the riser wall, leading to major mechanical damage.

The object of the present invention is to provide an improved bottom entry feed injection system for use in catalytic cracking processes which will result in better feed distribution in the reactor riser.

This object is achieved with the following nozzle for use in a fluid catalytic cracking unit comprising:

a first conduit for providing a passageway for enabling a first dispersing gas to flow therethrough;

a first cap covering the end of said first conduit, said first cap including at least one outlet passageway therethrough adapted for discharging said first dispersing gas into a liquid hydrocarbon feed material;

a second conduit enclosing said first conduit and spaced therefrom to form an annulus therebetween thereby providing a passageway for enabling said liquid hydrocarbon feed material to flow therethrough;

a second cap covering the end of said second conduit, said second cap being spaced from said first cap thereby forming a mixing zone therebetween for mixing said liquid hydrocarbon feed and said first dispersing gas; said

second cap including at least one circular slot as outlet passageway therethrough, which passageway is substantially aligned with the outlet passageway on said first cap and is adapted for discharging said mixture of said liquid hydrocarbon feed and said first dispersing gas.

The present invention improves feed atomization of bottom entry injection systems, thus eliminating the need for a side entry configuration and its drawbacks. It has been found that the bottom entry feed injection system of the instant invention achieves an improved feed atomization and distribution achieving a uniform feed distribution across the riser. The present feed injection system will distribute the hydrocarbon feed in a fine spray having a uniform coverage across the riser and a narrow droplet size distribution. Another advantage is that the atomized feed can be discharged in a substantially radial direction for better mixing with regenerated catalyst, without having to use a diverter cone. A further advantage is that the atomized feed can be discharged in a substantially radial direction, while not impinging the riser wall.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a preferred embodiment of a FCCU with a single bottom entry feed injection system.

FIGURES 2A/2B/2C show detail design features of the preferred feed injection system of Figure 1.

FIGURE 3 shows a prior art single bottom entry feed injection system.

FIGURE 4A shows a plan view of feed distribution in the riser of prior art side entry feed nozzles.

FIGURE 4B shows a plan view of improved feed distribution provided by a single nozzle according to the present invention.

C L A I M S

1. A nozzle for use in a fluid catalytic cracking unit comprising:

a first conduit for providing a passageway for enabling a first dispersing gas to flow therethrough;

5 a first cap covering the end of said first conduit, said first cap including at least one outlet passageway therethrough adapted for discharging said first dispersing gas into a liquid hydrocarbon feed material;

10 a second conduit enclosing said first conduit and spaced therefrom to form an annulus therebetween thereby providing a passageway for enabling said liquid hydrocarbon feed material to flow therethrough;

15 a second cap covering the end of said second conduit, said second cap being spaced from said first cap thereby forming a mixing zone therebetween for mixing said liquid hydrocarbon feed and said first dispersing gas said and said second cap including at least one circular slot as outlet passageway therethrough, which passageway is substantially aligned with the outlet passageway on said
20 first cap and is adapted for discharging said mixture of said liquid hydrocarbon feed and said first dispersing gas.

2. The nozzle of claim 1, wherein said circular slot includes a chamfer.

25 3. The nozzle of claim 3, wherein the chamfer has an angle between 0° and 10° with the outlet passageway.

4. The nozzle of any one of claims 1-3, wherein the outlet passageway through said second cap is adapted to discharge said mixture of said liquid hydrocarbon feed
30 and said first dispersing gas in a generally radial outward and upward direction.

5. The nozzle of claim 4, wherein said upward discharge angle is in the range of about 20° to 80° from the axis of said nozzle.

5 6. The nozzle of any one of claims 1-5, wherein the outlet passageway on said first cap includes a plurality of outlet passageways for discharging said first dispersing gas into said liquid hydrocarbon feed material to form a mixture thereof, and the circular slot outlet passageway on said second cap includes a plurality of
10 outlet passageways adapted for discharging said mixture of said liquid hydrocarbon feed and said first dispersing gas in multiple fan sprays and in a generally radial outward and upward direction.

15 7. The nozzle of any one of claims 1-5, wherein the outlet passageway on said first cap includes a plurality of outlet passageways for discharging said first dispersing gas into said liquid hydrocarbon feed material to form a mixture thereof, and the circular slot outlet passageway on said second cap is open along its entire
20 circumference, adapted for discharging said mixture of said liquid hydrocarbon feed and the first dispersing gas in a single fan spray and in a generally radial outward and upward direction.

25 8. The nozzle according to any one of claims 1-7, wherein said second cap includes a conical surface which includes the circular slot outlet passageway and said first cap includes a conical surface having at least one outlet passageway.

30 9. The nozzle of any one of claims 1-8, wherein the outlet passageway through said first cap includes a plurality of substantially round holes.

10. The nozzle of any one of claims 1-9, wherein a passageway is present for enabling part of the liquid hydrocarbon feed material to be discharged in a more
35 central position, between the first cap and second cap,

relative to the position of the outlet passageway of said first cap.

11. The nozzle of any one of claims 1-10, wherein a third conduit is present surrounding said second conduit and forming an annulus therebetween for providing a passageway for enabling a second dispersing gas to flow therethrough.

12. A fluid catalytic cracking unit comprising:

at least one riser reactor;

at least one nozzle located in the bottom of said riser according to any one of claims 1-11 and a regenerator standpipe through which hot regenerated catalyst enters the riser bottom region.

13. The fluid catalytic cracking unit of claim 12 wherein the third conduit of the feed nozzle terminates at a point above the level of the centerline of said standpipe entering the riser.

14. Use of a fluid catalytic cracking unit of any one of claims 12-13 in a process to catalytically convert a hydrocarbon feed.

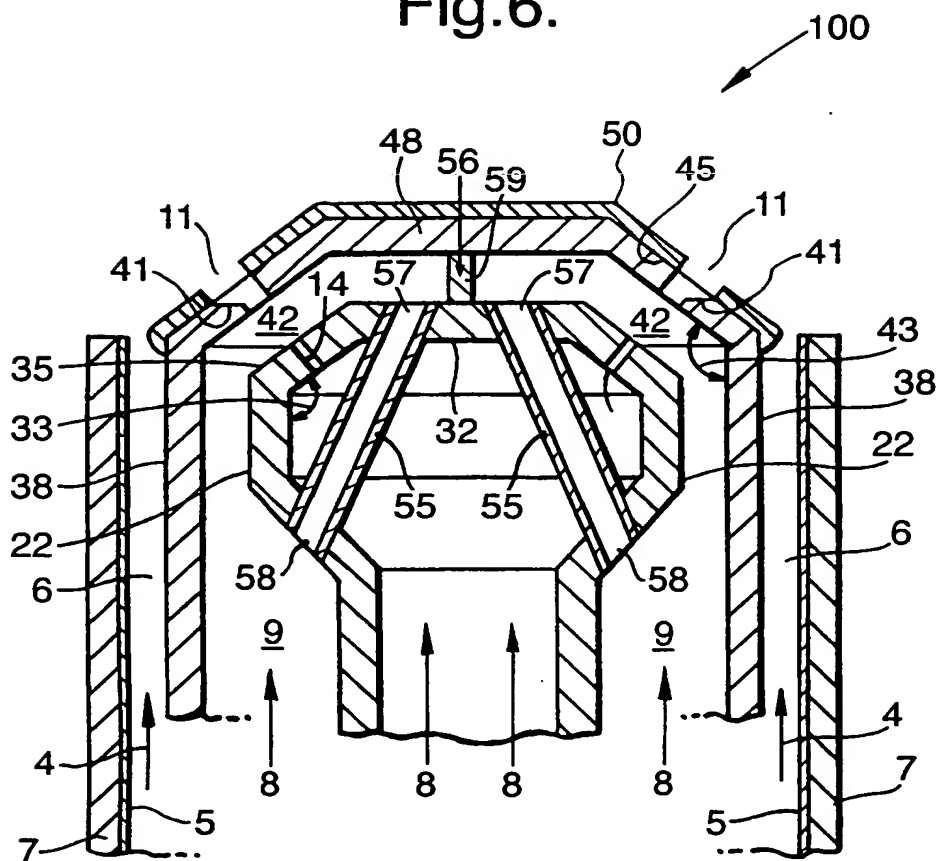
15. A method of injecting feed into a fluid catalytic cracking unit comprising the steps of:

introducing a liquid hydrocarbon feed and a dispersing gas into a feed nozzle according to any one of claims 1-11 in the bottom of a riser;

mixing said liquid hydrocarbon feed and said dispersing gas in a mixing zone in said feed injection system; and

discharging said mixture of said liquid hydrocarbon feed and said dispersing gas from said feed injection system in as a conical formed spray in a generally radial outward and upward direction.

Fig.6.



**(19) World Intellectual Property Organization
International Bureau**



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

(43) International Publication Date
15 March 2001 (15.03.2001)

PCT

(10) International Publication Number
WO 01/18153 A2

(51) International Patent Classification⁷: C10G 11/00

[US/US]; 2215 Bent River Drive, Sugar Land, TX 77479 (US). DIRKSE, Hendricus, Arien [NL/NL]; Badhuisweg 3, NL-1031 CM Amsterdam (NL).

(21) International Application Number: PCT/EP00/08653

(22) International Filing Date:
1 September 2000 (01.09.2000)

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data: 09/390,230 3 September 1999 (03.09.1999) US

(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V. [NL/NL]; Carel van Bylandtlaan 30, NL-2596 HR The Hague (NL).

Published:

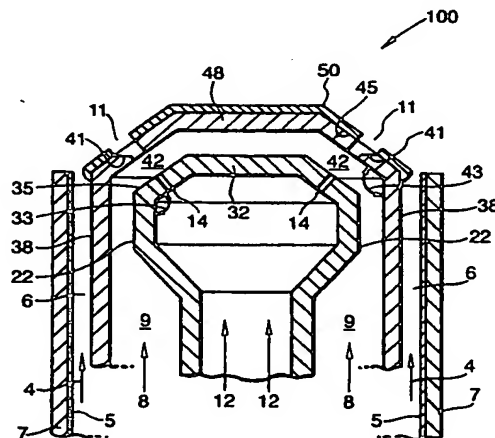
— Without international search report and to be republished upon receipt of that report.

(72) Inventors; and

(75) Inventors/Applicants (for US only): CHEN, Ye-Mon

[Continued on next page]

(54) Title: FEED INJECTION SYSTEM FOR CATALYTIC CRACKING PROCESS



(57) **Abstract:** A nozzle for use in a fluid catalytic cracking unit comprising: a first conduit for providing a passageway for enabling a first dispersing gas to flow therethrough; a first cap covering the end of said first conduit, said first cap including at least one outlet passageway therethrough adapted for discharging said first dispersing gas into a liquid hydrocarbon feed material; a second conduit enclosing said first conduit and spaced therefrom to form an annulus therebetween thereby providing a passageway for enabling said liquid hydrocarbon feed material to flow therethrough; a second cap covering the end of said second conduit, said second cap being spaced from said first cap thereby forming a mixing zone therebetween for mixing said liquid hydrocarbon feed and said first dispersing gas and said second cap including at least one circular slot as outlet passageway therethrough, which passageway is substantially aligned with the outlet passageway on said first cap and is adapted for discharging said mixture of said liquid hydrocarbon feed and said first dispersing gas.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.